

**UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056**

In the matter of the petition of

Cessna Aircraft Company

for an exemption from § 25.161(d)
of the Code of Federal Regulations

Regulatory Docket No. FAA-2004-17072

GRANT OF EXEMPTION

By letter L390-04-0688, dated February 17, 2004, Larry Van Dyke, Manager of Airworthiness, Cessna Aircraft Company, One Cessna Boulevard, P.O. Box 7704, Wichita, Kansas 67277-7704, petitioned for an exemption from § 25.161(d) of the Code of Federal Regulations (14 CFR). This exemption, if granted, would provide relief concerning the engine-out lateral/directional trim on Cessna Model 680 airplanes.

The petitioner requests relief from the following regulation:

Section 25.161(d) requires the airplane maintain longitudinal, directional, and lateral trim (and for lateral trim, the angle of bank may not exceed five degrees) at $1.3 V_{SR1}$ during climbing flight with -

- (1) The critical engine inoperative;
- (2) The remaining engines at maximum continuous power; and
- (3) The landing gear and flaps retracted.

V_{SR1} is defined in part 1 of the CFR as the reference stall speed in a specific configuration.

The petitioner's supportive information is as follows:

Cessna Aircraft Company's application for a new type certificate for the Model 680 Sovereign airplane was filed on November 24, 1999. Included in the certification basis of this airplane is § 25.161(d), as amended by Amendments 25-1 through 25-98, and including the 1-g stall reference speed as an equivalent safety finding.

“Results of Model 680 flight testing

“Flight-testing of the Cessna Model 680 has shown that the airplane exhibits a rolling moment that cannot be fully trimmed out during one engine inoperative flight, with asymmetric fuel loads at $1.3V_{SR1}$ as specified in § 25.161(d). As concluded by the FAA in exemption No. 6431 for the Cessna Model 750, *‘the existing requirements are unnecessarily restrictive for twin engine airplanes.’* As in the Model 750 case, the Model 680 enroute climb speed is constant with weight and is much higher than $1.3 V_{SR1}$. This speed is currently 180 KIAS, but will be changed to 160 KIAS to accommodate improved climb gradient when the airplane is certified for takeoff above 10,000 feet field elevation. At 180 KIAS, the Model 680 can be trimmed and meets the intent of the rule as interpreted in the Model 750 exemption. At 160 KIAS, the Model 680 can be trimmed longitudinally and directionally, but has very light residual lateral force.

“Flight-testing with ice shapes used to comply with § 25.1419 for normal operations, flight into known icing, has shown that the airplane can be trimmed longitudinally and directionally, but again exhibits a slight rolling moment that cannot be fully trimmed out, during one engine inoperative flight, with asymmetric fuel loads at 160 KIAS. However, the airplane with ice shapes can be trimmed with resulting aileron and rudder forces remaining within the applicable requirements of § 25.143. Section 23.161(d) has been revised to allow the lateral control force to *‘not exceed 5 pounds,’* which is the § 25.143 requirement. Based on this further interpretation, the Model 680 can be trimmed and meets the intent of the rule as interpreted in the Model 750 exemption. The Wichita ACO has successfully flown this condition at 160 KIAS.

“In both of the above cases, the airplane can be trimmed and the autopilot engaged without exceeding autopilot servo monitor lateral torque limits.

“Public Interest”

Cessna believes that flight characteristics of the airplane, if granted by this exemption, would provide enhanced safety and reduced pilot workload over what would be achieved with design changes required to achieve literal compliance with the rule. “Cessna chose to use an electrically powered trim system that significantly reduces pilot workload when trimming the airplane in all operations, and that enhances the operational safety when compared to the manual systems on many other airplanes, including other Cessna airplanes. When powered systems are used, consideration must be given to actuator failure in the full travel position. Full-trim malfunctions were demonstrated during Model 680 FAA certification testing and found to be easily manageable. While more trim authority can be achieved with a design change, and probably not result in unsatisfactory trim malfunction certification test results, it would degrade the operational safety. The Model 680 enroute climb speed is well above that required in 14 CFR 25.161(d) and the resulting trim forces are within the 14 CFR 25.143 limits. Literal compliance with the requirement could be achieved by costly redesign of the aircraft system, but with no affect on the level of safety.

“Request for expedited consideration of this petition

“Cessna acknowledges that this petition was not submitted in accordance with the 120-day requirement of § 11.63(d). The reason for this delayed request is that the applicable flight-testing that revealed the airplane was not in direct compliance with requirements of the rule was not conducted until late in the certification program. Cessna Aircraft Company consequently requests that the publication and comment period requirements of § 11.85 be waived.”

Publication waived

The FAA has determined that good cause exists for waiving the requirement for *Federal Register* publication and comment because the exemption, if granted, would not set a precedent, and any delay in acting on this petition would be detrimental to Cessna Aircraft Company.

The FAA's analysis/summary is as follows:

The FAA has considered the information provided by the petitioner and has determined there is sufficient merit to warrant granting this petition for an exemption to § 25.161 pertaining to the critical engine inoperative lateral trim requirement of paragraph (d).

Section 25.161 requires that each airplane must meet the trim requirements of this section after being trimmed, and without further pressure upon, or movement of, either the primary controls or their corresponding trim controls by the pilot or the automatic pilot. Paragraph (d) of § 25.161 specifies the airplane must maintain lateral trim at $1.3 V_{SR1}$ during a one engine inoperative climbing flight.

For the Cessna Model 680, the FAA has determined that it is not necessary to show strict compliance with § 25.161(d) with regard to lateral trim, and that it is in the public interest to accept the small wheel control forces in the airplane's roll axis that cannot be trimmed. The relatively short duration for the one engine inoperative climb segment, and the 5 pounds maximum allowable wheel control force in the roll axis would not significantly overburden the pilot's workload during this segment.

To take advantage of improved climb performance above a 10,000-foot altitude, the proposed one engine inoperative enroute climb speed for the Cessna Model 680 is a constant 160 KIAS for all gross weights. The petitioner has chosen this single speed to optimize climb performance over a weight range, rather than strictly adhering to the $1.3 V_{SR1}$ requirements in § 25.161(d), to simplify operating procedures. However, the petitioner states the airplane exhibits a rolling moment that cannot be completely trimmed at 160 KIAS under the conditions in § 25.161, and that “very light residual lateral force” is required to maintain the climb flight path. Further, the petitioner states that a similar condition exists with ice shapes used to comply with § 25.1419, where the resulting aileron and rudder control forces at the 160 KIAS climb speed are within the applicable requirements of § 25.143(c) (5 pounds for long-term application in the airplane's roll axis).

The FAA has reviewed the above conditions with resulting small wheel control forces in the airplane's roll axis, and has determined that it is in the public's interest to accept these forces. The single 160 KIAS climb speed for all gross weights offers a simpler operating procedure for the flight crew during climb with an engine failure. Strict adherence to § 25.161(d) and a climb speed of 1.3 V_{SR1} would require the flight crew to determine climb speed as a function of airplane gross weight. This simplified operating procedure is a safety benefit that reduces pilot workload during the engine inoperative climb segment.

The petitioner has indicated that literal compliance with § 25.161(d) would require a major design change to a manual lateral trim system on the airplane. They further point out that the electrically powered trim system on the current airplane significantly reduces pilot workload during all operating conditions thus, enhancing the operational safety. In light of this safety benefit, the high cost of redesigning the trim system, and delaying delivery of the airplane, it is in the public's interest retain the existing trim system.

Finally, the petitioner states that the 160 KIAS one engine inoperative climb condition with small wheel control force, as discussed above, can be flown with the autopilot engaged and without exceeding autopilot servo monitor lateral torque limits. Engaging the autopilot during this condition would therefore provide some relief to the pilot in maintaining the untrimmed condition.

In consideration of the foregoing, I find that a grant of exemption is in the public interest and will not adversely affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, the petition of the Cessna Aircraft Company for an exemption from the lateral trim requirements of 14 CFR 25.161(d) on Cessna Model 680 airplanes, is granted.

Issued in Renton, Washington, on March 24, 2004.

/s/ Kalene C. Yanamura
Kalene C. Yanamura
Acting Manager
Transport Airplane Directorate
Aircraft Certification Service